MANIPAL
ACADEMY of HIGHER EDUCATION
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Reg. No.										

DEPARTMENT OF SCIENCES, I SEMESTER M.Sc. (CHEMISTRY)
END SEMESTER EXAMINATIONS, DECEMBER 2018

SUBJECT: Inorganic Chemistry [CHM - 4101]
(REVISED CREDIT SYSTEM-2017)

Time: 3 Hours Date:21-12-2018 MAX. MARKS: 50

Note: (i) Answer **ALL** questions.
(ii) Draw diagrams, and write equations wherever necessary.

1. A. i) Compare the basic principles and features of VBT and MOT.
ii) How do you account for the observed bond angles: NH_3 (107.3°), PH_3 (93.3°), AsH_3 (91.8°), SbH_3 (90.3°)?
iii) How does the hydrogen bonding affect the physical properties of compounds?
B. Comment on each of the following observations from the bonding perspective
i) Ionic compounds are soluble in aqueous medium but not in non-polar liquids.
ii) An aqueous solution of glucose does not conduct electricity while that of salt does.
iii) Grease dissolves in benzene but not in the water.
iv) CuCl is more covalent than NaCl.

(6+4)

2. A. i) Describe the energy changes which take place in the formation of calcium fluoride using the Born-Haber cycle.
ii) How do you explain the dissolution of table salt in water? How do you account for the different solubility of silver halides?
iii) Compare the properties of ionic compounds with that of covalent compounds.
B. i) Distinguish clearly between the following terms;
a) Random and systematic error
b) Masking and demasking
c) Co-precipitation and post-precipitation
d) Sigma and pi molecular orbitals
ii) The observed dipole moments of KF and KI are 28.689 X 10^{-30} Cm & 30.825 X 10^{-30} Cm and the bond lengths are 214 pm and 305 pm respectively. Calculate the percent ionic character of the bonds in each.

(6+4)

3. **A. i)** Explain the electrical conductivity of metals based on the electron sea model and the band theory of metals

ii) What is the significance of the terms Ψ^2 and "Radius ratio"?

iii) Explain the three conditions for the formation of the ionic bond. Write explanations to illustrate the three trends in bond enthalpy values of typical diatomic molecules.

B. Give reasons for the following';

i) Cryptands are better chelating agents than crown ethers.

ii) Zeolites are used as molecular sieves.

iii) The melting point of alkali metals decreases down the group.

iv) Complexation tendency is more in alkaline earth metals than alkali metals.

(6+4)

4. **A. i)** What is nitrogen cycle? Explain the nitrogen fixation of atmospheric nitrogen by nitrogenase enzymes.

ii) What are hydrides? Explain the structural characteristics of interstitial hydrides.

iii) Explain the reactions of alkali metals with liquid ammonia.

B. i) Distinguish between the following with illustrative examples;

a) Halogens and pseudo halogens **b)** Boranes and carboranes

ii) What are phosphazenes? Explain the structures of phosphonitrilic trimers.

(6+4)

5. **A. i)** Write any two similarities and differences between lanthanides and actinides. How are higher actinides synthesized?

ii) Explain the electronic spectra and complex formation of f-block elements.

B. i) Describe the structural features of crystalline allotropes of carbon and mention their applications.

ii) What is a breeder reactor? How do you separate U^{235} from U^{238}?

(6+4)

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